



NOVEMBER 2014

5...4...3...2...1...

SPACE LAUNCH SYSTEM HIGHLIGHTS

Orion Gets Ready for First Flight

NASA's Orion spacecraft completed its move to Cape Canaveral Air Force Station Space Launch Complex 37 in Florida at 3:07 a.m. Nov. 12. Orion's first flight test, which launched on Dec. 5, will evaluate launch and high-speed re-entry systems such as avionics, attitude control, parachutes and the heat shield before it is flown on the first uncrewed test flight of the Space Launch System (SLS). For more on the Marshall Space Flight Center and North Alabama's contributions to Orion's first flight, click [here](#). (NASA)



Connecting the Pieces for Orion's First Flight

Here's a pictorial look back at the stage adapter work at NASA's Marshall Space Flight Center in preparation for Orion's first flight test. The stage adapter connects the Orion to the Delta IV Heavy and was designed, built and tested at Marshall. The same adapter technology will connect the Orion to SLS.



JUNE 2012

A state-of-the-art milling tool is used to create the pathfinder version of the adapter hardware design at Marshall. The term "pathfinder" refers to an early version of the hardware that is not intended to fly, but to prove the concept and feasibility of manufacturing the design. (NASA/MSFC)



OCTOBER 2012

Pathfinder adapter hardware nears completion as engineers use a state-of-the-art vertical welding tool to move it for the finishing touches at the Marshall Center. (NASA/MSFC)



NOVEMBER 2012

A Marshall welding technician conducts the first circumferential weld of the pathfinder version of the adapter design. (NASA/MSFC)



DECEMBER 2012

Marshall engineers receive materials to begin manufacturing the flight adapter. (NASA/MSFC)



MAY 2013

The pathfinder adapter is flipped at Marshall testing facility Building 4705. The turnover is an important step in finishing the machining work on the hardware. (NASA/MSFC)



JUNE 2013

The adapter and a United Launch Alliance Delta IV test article were successfully connected during a fit check at Marshall. (NASA/MSFC)



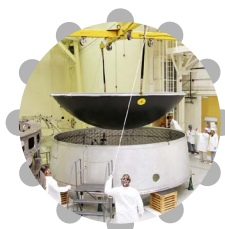
SEPTEMBER 2013

Orion's stage adapter diaphragm was delivered from a manufacturing facility at Janicki Industries in Hamilton, Washington, to Marshall. The diaphragm will be used to keep launch vehicle gases away from the Orion spacecraft during its test flight. (NASA/MSFC)



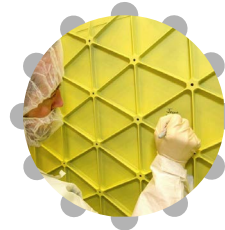
NOVEMBER 2013

A technician at Marshall applies the finishing touches on the stage adapter. The top coat for the adapter is a special paint that protects the hardware and its components, like sensors, from electrical discharge on ascent. (NASA/MSFC)



NOVEMBER 2013

The adapter diaphragm was joined to an adapter prototype for pressurized testing at Marshall. For the test, the adapter was sealed, and a vacuum pump was connected to the diaphragm. The vacuum pressure simulates atmospheric conditions the hardware may experience during the mission. (NASA/MSFC)



DECEMBER 2013

Marshall team members who were involved in the design, construction and testing of the adapter had the opportunity to autograph it before the hardware was shipped to NASA's Kennedy Space Center in Florida. (NASA/MSFC)

Connecting the Pieces (contd)



JANUARY 2014

A test article of the stage adapter aced structural loads testing at Marshall's East Test Area. (NASA/MSFC)



JANUARY 2014

Marshall team members involved in the adapter work celebrated its completion in Building 4708. (NASA/MSFC)



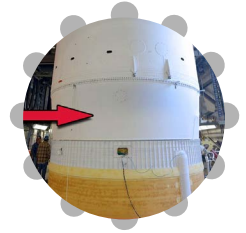
APRIL 2014

The adapter is loaded onto a truck at Marshall and delivered to United Launch Alliance in Decatur. (NASA/MSFC)



MAY 2014

The stage adapter arrived by barge at Cape Canaveral, Florida, from United Launch Alliance. (NASA/KSC)

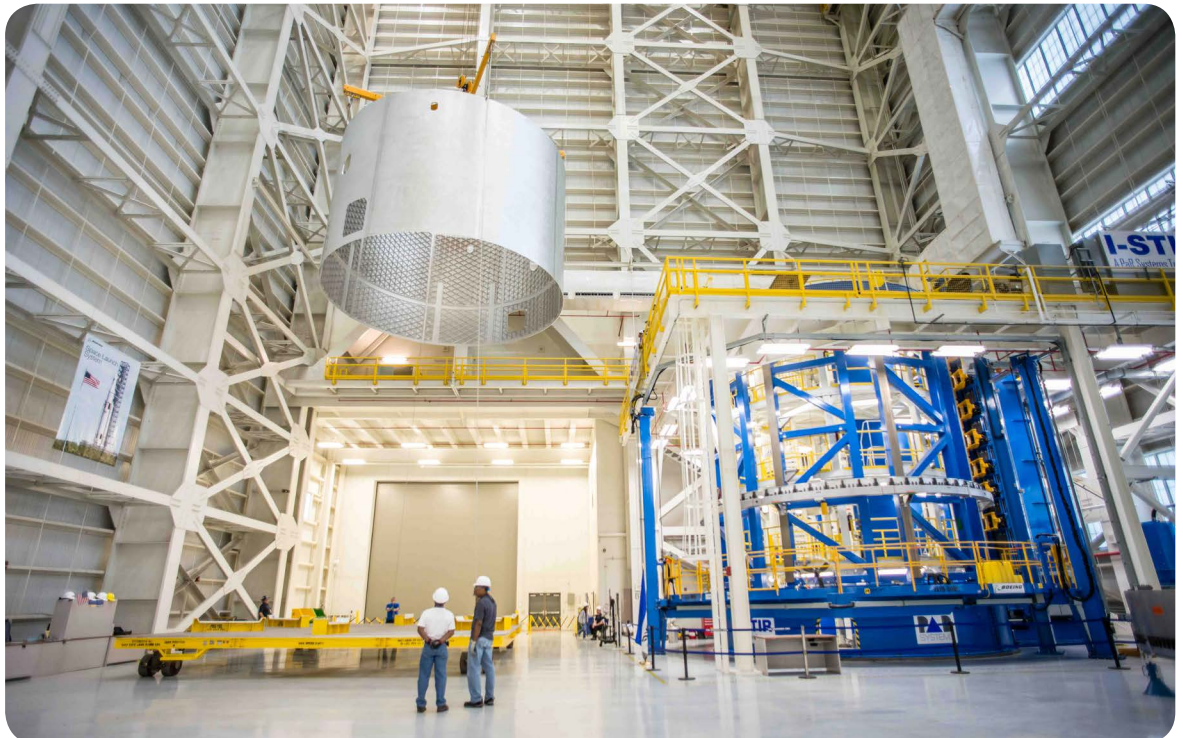


NOVEMBER 2014

The adapter connects the Orion to the Delta IV Heavy on Nov. 12 at Space Launch Complex 37 in Florida. The spacecraft was fully connected to the rocket and powered on for final testing and preparations in the weeks leading up to launch. (NASA/KSC)

SLS Engine Section Barrel Hot off the Vertical Weld Center at Michoud

The barrel for the engine section of the SLS is taken off the Vertical Weld Center at NASA's Michoud Assembly Facility in New Orleans. The barrel is flight hardware to be used on the first uncrewed test flight of the 70-metric-ton configuration of the rocket. The engine section, made up of the barrel and a ring—also welded at Michoud—will hold four RS-25 engines that will power the core stage of the SLS. (NASA/Michoud)



Spaceflight Partners: Boeing Phantom Works

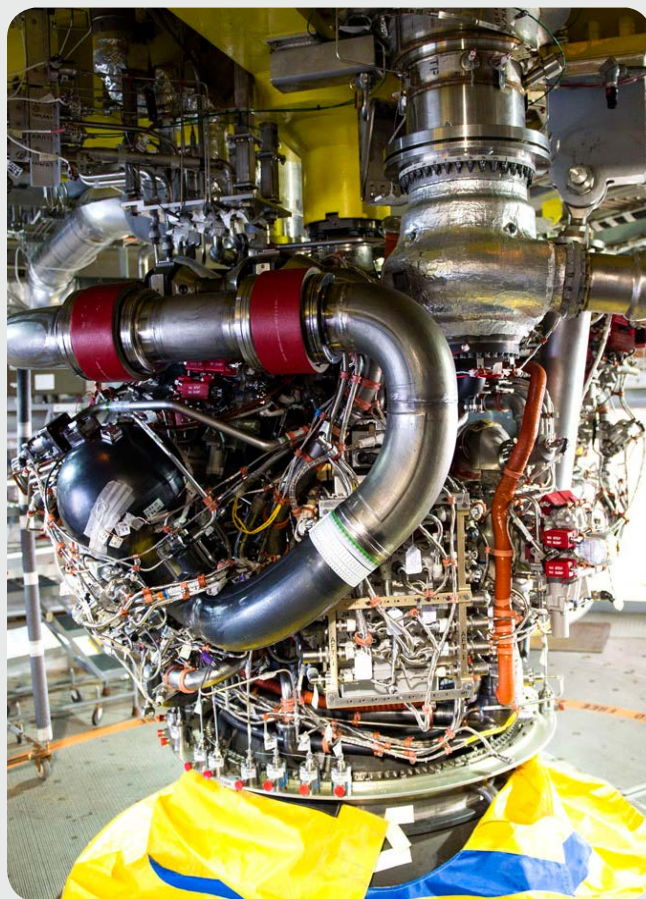
EDITOR'S NOTE: Every month, SLS Highlights turns the spotlight on one of the many industry partners helping to create the largest rocket ever built for human space exploration. In this issue, we profile Boeing Phantom Works of St. Louis, Missouri.

When NASA launches the SLS to send astronauts to new destinations in space, the four RS-25 engines powering the rocket will each feature a brand new “brain.” The engine controller unit for the RS-25—formerly known as the space shuttle main engine (SSME), designed and developed by Aerojet Rocketdyne of Sacramento, California—allows communication between the vehicle and the engine in real time. It processes commands from the vehicle to the engine and transmits data back to the vehicle.

Because the computer that controlled the SSME was manufactured in the early 1980s, many of the parts must be outfitted with today's technology. Aerojet Rocketdyne, with assistance from Boeing Phantom Works engineers in Huntsville, Alabama, have been updating the technology and adapting the controller software that was used on the J-2X engine to the RS-25 engine.

The Boeing Phantom Works engineers are effectively lending their knowledge and expertise to design, implement and test the software on the controller. An engineering model RS-25 controller is being tested at NASA's Marshall Space Flight Center in Huntsville under a simulated range of conditions, and engineers are simulating the RS-25 in flight at Stennis Space Center near Bay St. Louis, Mississippi, using engine actuators, sensors, connectors and harnesses.

“Given that I'm beginning my career as an engineer, this type of work is extremely fascinating to me,” said Tom Childress, a Boeing Phantom Works software engineer supporting a suite of controller test tools in a fully automated laboratory. “I'm honored to work on a program aimed at the advancement of human space travel.”



The RS-25 engine with its new “brain”—the engine controller unit—was recently installed on the A-1 Test Stand at NASA's Stennis Space Center. The RS-25 will be tested at the higher thrust and other operating requirements for the SLS, as well as the new engine controller. The advanced controller regulates valves that direct the flow of propellant to the engine, which determines the amount of thrust generated during an engine test. (NASA/Stennis)

It's also exciting for experienced engineers as well. “I would echo that,” said Doug Fries, senior software engineer at Boeing, who has supported the software design and implementation. “It's extremely rewarding to know the work we are applying to the engine controller will be used to send astronauts back into space. It's truly an exciting time.”

SLS Program Wins Aviation Week Excellence Award



The SLS Program was honored Nov. 19 at Penton's Aviation Week's 2014 Program Excellence Awards. As the industry's pre-eminent honor for strong program performers with innovative ideas, technologies and process improvements, the awards were announced at a gala dinner during Aviation Week's Aerospace & Defense Programs Conference in Litchfield Park, Arizona. Winners were selected based on a multi-tiered evaluation by program-leadership experts who judged value, leadership, performance and other criteria. (NASA/MSFC)

SLS On the Road...

Michoud Assembly Facility Director Roy Malone talks to middle school students at the University of New Orleans Space Day about the work going on at Michoud to build the core stage of the SLS. The event was featured in the **Times-Picayune**. (NASA/Michoud) ►



◀ Chip Howat from NASA's Michoud Assembly Facility explains the different parts of the SLS to participants at the University of New Orleans Space Day. The Nov. 20 event was held to encourage and inspire middle school students to learn about science, technology, engineering and math (STEM) through hands-on activities focusing on NASA space exploration. (NASA/Michoud)

SLS on Deck:

Follow SLS on:



- RS-25 engine chill test
- Foundations complete for new SLS test stands at Marshall
- First confidence weld on Vertical Assembly Center